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ABSTRACT

This paper illustrates the use of the McNemar Test, using a hypothetical problem. The McNemar Test is a nonparametric statistical test that is a type of chi square test using dependent, rather than independent, samples to assess before-after designs in which each subject is used as his or her own control. Results of the McNemar test make it possible to determine whether there is a significant difference between the pretest and posttest scores of students on the dependent variable. A significant difference usually implies that an intervention or treatment has had an effect. In the hypothetical example, an elementary school counselor is asked to conduct group guidance activities for all 278 students at an elementary school because teachers suspect some students are cheating. The counselor administers the same questionnaire about attitudes toward cheating before and after a counseling program. The example shows that the McNemar test is relatively easy to calculate and interpret. One limitation is that of sample size: the McNemar test is designed for use with large samples. (SLD)

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A Method for Assessing Change in Attitude: The McNemar Test.

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A Method for Assessing Change in Attitude: The McNemar Test.

A major goal of school counselors is to effect change in the behavior and attitudes of their student clients so that they can live more productive and satisfying lives. Areas where changes are often sought include, but are not limited to, relationships with others, family situations, academic achievement, behavior problems, poor self-esteem, and negative attitudes. School counselors may assist their students in changing their faulty behavior or negative attitudes by using various interventions and strategies. According to Doyle (1998), the strategies and interventions that counselors use may be described as cognitively, affectively, or behaviorally (performance) focused.

To determine whether the strategy or intervention was successful, school counselors may use a specific instrument. The instrument may be a self-concept inventory, a satisfaction questionnaire, an attitude inventory, or some other instrument. Usually, the items are in statement form requiring a simple "yes" or "no" response. An example of such an item might be, "If a test is not fair, cheating is OK."

Prior to using a specific intervention or strategy, the school counselor will administer one of these instruments to the students to establish a baseline. Once the strategy or intervention is completed, the school counselor will post-test the students using either the same or equivalent form of the instrument in order to assess whether change has taken place.

School counselors may assess the effectiveness of the intervention or strategy using the McNemar Test. The McNemar Test is a nonparametric statistical test. Nonparametric statistical tests are distribution free, which means that the samples selected do not have to be normally distributed (Ciechalski, 1990). It is a type of Chi-Square Test using dependent, rather than independent samples to assess before-after designs in which each subject is used as his or her own control (Sprinthall, 2000; Sheskin, 1997; Siegel & Castellan, 1988). Like the Chi-Square Test, the McNemar Test evaluates data in nominal or categorical form.

The purpose of this poster session is to illustrate the use of the McNemar Test using a hypothetical problem. The results of the McNemar Test will enable us to determine whether or not there is a significant difference between the pretest and posttest

scores of students on the dependent variable. A significant difference usually implies that an intervention or treatment has had an effect.

METHOD

Problem

An elementary school counselor is asked by the teachers to conduct group guidance activities for students because the teachers suspect that some of their students are cheating on tests.

Participants

The participants consisted of the entire student body (N = 278).

Instrument

The school counselor prepared a 10-item questionnaire for administration to all of the classes in the school. All of the items consist of statements that are to be answered either "Yes" or "No." The statements are worded in such a way that a "Yes" response indicates a possibility of cheating. For example, two of the statements are "A little cheating on a test doesn't hurt" and "If a test is not fair, cheating is OK." To score the test, the "Yes" and "No" responses are counted separately and the difference between them determines a dichotomous, yes or no answer. For example, if a student answered the 10-item questionnaire with 6 "Yes" and 4 "No" responses, the resulting score would be a "Yes." On the other hand, if a student produced 3 "Yes" and 7 "No" responses that score would be "No."

Procedure

The counselor meets individually with each class in the school. The total number of students in the study is 278. Before beginning the first session, the counselor administers the 10-item questionnaire (Pre-test). After collecting the questionnaires, the counselor begins the first session. The program consists of three sessions that include activities, videos, and discussions. At the end of the third session, the counselor administers the same questionnaire (Post-Test) to the students.

Hypothesis

Null Hypothesis: a = d

Analysis

To analyze the results, the counselor prepares a contingency table as follows:

	POST-TEST	
	NO	YES
PRE-TEST	a	b
YES	86	22
	c	d
NO	134	36

RESULTS

Once the contingency table is completed, the information is plugged into the McNemar Test formula as follows:

$$X^2 = \frac{|a - d|^2}{a+d}$$

$$X^2 = \frac{|86-36|^2}{86+36}$$

$$X^2 = \frac{|50|^2}{122}$$

$$X^2 = \frac{2500}{122}$$

$$X^2 = 20.49$$

To interpret the results, use the critical values of chi-square table. The table value for the Chi-Square test at the .01 level is 6.64. Using the McNemar Test formula, the value obtained is 20.49. Since the value of 20.49 is larger than the table value of 6.64, we

reject the null hypothesis. The difference in change scores is significant between the pre-test and post-test scores at the .01 levels. Since the direction of change is important, inspection of the values will determine the desirability of the change.

DISCUSSION

The McNemar Test is relatively simple to calculate and interpret. Like chi-square, the McNemar Test is a nonparametric statistical test using nominal or categorical data. Unlike chi-square, the McNemar test can be used to assess pre- and post-test design using two dependent samples.

One of the limitations of the McNemar Test deals with sample size. The McNemar Test is designed for use with large samples. If the sample size is relatively small, a correction formula like the Yates correction formula should be used instead of the McNemar Test.

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